

Why Rye Cover Crops Are Great Natural Weed Killers

John Teasdale is trying to answer a question that might seem obvious: Why does rye work as a cover crop? Rye suppresses weeds without herbicides, making it a common cover crop on organic farms.

The mechanics of how it works seem simple enough. When cut down and flattened on the soil, rye stalks block sunlight and prevent germinating weeds from getting the light they need. Rye's root system also captures nutrients and holds the soil, preventing erosion and making it particularly attractive to farmers in the Chesapeake Bay watershed and other areas where runoff is a concern. It also grows at cold temperatures, making it ideal for fall planting and winter growth.

But Teasdale, research leader at the Sustainable Agricultural Systems Laboratory in Beltsville, Maryland, has teamed up with Cliff Rice, an ARS chemist, to see if more is going on with rye. They think that something in rye affects soil chemistry in ways that help the plant suppress weeds. In their studies, they are trying to determine when and at what levels some of the plant's key organic compounds are released into the soil and whether they enhance weed suppression. Their goal is to find ways—either through improving varieties of rye or determining when and how it should be managed—to improve its weed-controlling abilities.

They raised rye in test plots in Beltsville, killed it with herbicide, and then either tilled it shallowly into the soil or left the dead rye stalks untilled on the surface. They planted pigweed and lettuce and took soil samples at weekly intervals. Then they extracted organic material from the soil and measured the levels of compounds known as “benzoxazinoids” that were released from the rye.

The study was one of the first attempts to measure rye-derived benzoxazinoids in field soil and examine their impact on weeds under field conditions. Previous work focused on rye extracts studied in controlled laboratory or greenhouse experiments.

The researchers say that other compounds could be involved in weed suppression, but their early results suggest that benzoxazinoids affect soil chemistry in ways that enhance rye's weed-suppressing ability and are worthy of further study. There were lower-than-expected concentrations of the benzoxazinoids in the soil, and weeds began to grow better as concentrations of the compounds diminished—within a few weeks of when the rye was killed. The benzoxazinoids reached peak levels about a week after the rye was killed and those levels dropped considerably within 2 or 3 weeks.

Additional studies will be required before the researchers can provide guidance on growing and management techniques. They still need to examine other factors that likely play a part in weed suppression, such as how long rye should be grown before it is killed, the impact of weather and soil conditions, and the amounts of biomass needed to maximize its effects.—By **Dennis O'Brien, ARS.**

The research is part of Soil Resource Management, an ARS national program (#202) described on the World Wide Web at www.nps.ars.usda.gov.

John Teasdale and Cliff Rice are with the USDA-ARS Sustainable Agricultural Systems Laboratory, 10300 Baltimore Ave., Beltsville, MD 20705-2325; phone (301) 504-5504, fax (301) 504-6491, e-mail john.teasdale@ars.usda.gov, cliff.rice@ars.usda.gov. ✱

Rye cover crop.